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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

JULY 1945

EROSION CONTROL PRACTICES DIVISION

Corn Canopy Reduces Soil Loss - Russell Woodburn, State College, Mississippi.-"The protective effect of a vegetative canopy, even a corn crop, was strikingly shown by records of soil loss from three intense rains on July 24 and 27. Erosion losses from a bare plot and two corn plots were as follows:

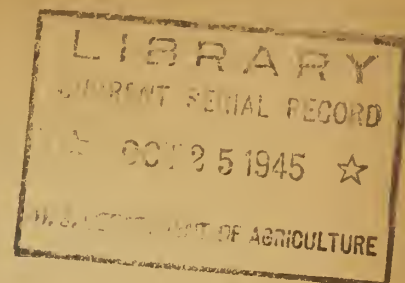
Date	Amount of rain	Bare plot, 9 per cent slope	Corn plot No. 10, 12.5 per cent slope	Corn plot No. 9, 12.5 per cent slope
	<u>Inches</u>	<u>Pounds soil loss per acre</u>		
July 24 - A.M....	0.91	1,136	0	0
24 - P.M....	1.70	19,880	3,220	0
27.....	0.96	11,680	5,920	2,080

"The rain of July 24 A.M., following the long dry period, caused only slight erosion from the bare plot. The 1.70-inch rain in the afternoon caused heavy soil loss from the bare plot and none from 8 corn plots on slopes from 2.5 per cent to 10.0 per cent. In fact, there was no loss from plot 9 on a 12.5 per cent slope, with a good stand of mature corn plants. The situation was entirely different on plot 10, however, with the same corn cover. Plot 10 is at the south end of the line of plots. The wind accompanying the storm came from the southwest and blew the corn down for several rows along the south side of this plot, virtually laying bare and unprotected the surface in a strip several feet wide. The erosion loss was over 1-1/2 tons per acre.

"This effect was again prominent on the July 27 rain. This rain was very intense as indicated by a bare plot loss of nearly 6 tons per acre for a 0.96 inch rain. There was no loss to very light loss on all corn plots through the 10 per cent slope. Plot 9 had about 1 ton per acre. Plot 10 with the unprotected strip along one side, caused by the fallen corn, lost nearly 3 tons per acre."

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.



Tillage Methods for Oats Following Annual Lespedeza - T. C. Peele, Clemson, S. Carolina.-"During the past year, tillage tests with oats following Kobe lespedeza cut for hay were conducted on large field plots in an effort to determine the effects of these treatments on grain yields. Runoff and erosion were greatly reduced when seeding methods were used which left considerable plant residue on the surface to serve as a mulch during the winter months. Seeding the oats with a deep furrow drill without previous land preparation, and seeding oats with an ordinary drill after mulch-plowing the area with 30" sweeps were effective methods of controlling erosion during the growth of the oats.

"The mulch-plowing method gave considerably better grain yields than seeding oats with no soil preparation. The grain yields for the plots receiving no land preparation before drilling the oats with a deep furrow drill are significantly lower than the yields for the other three treatments. While yield data have not been tested statistically as yet, it is probable that there are no significant differences in yields between the plots that were thoroughly disked, those that were mulch-plowed and those that were plowed with a disk plow prior to drilling the oats. Oat yields, runoff, and soil loss on the various tillage plots were as follows:

Tillage treatment	Yield of oats in bushels per acre		November 1, 1944 to June 1, 1945	
			Runoff	Soil loss per acre
	<u>Plots</u>	<u>Average</u>	<u>Per cent</u>	<u>Pounds</u>
No land preparation, oats seeded with deep furrow drill	47.3	46.3	0.9	55
	49.4			
	37.8			
	50.6			
Soil disked thoroughly and oats drilled with an ordinary disk drill	67.4	60.8	17.7	2,172
	57.5			
	63.3			
	55.0			
Soil mulch-plowed using 30" sweeps and oats drilled with an ordinary disk drill	67.3	64.3	0.7	38
	65.0			
	61.3			
	63.4			
Soil plowed with disk plow and oats drilled with an ordinary disk drill	72.4	65.0	1/	1/
	64.4			
	56.1			
	66.8			

1/ Not reported.

Cover Crop Mulching Methods in Corn Production.-"Two mulch farming methods are being tested with corn following winter legumes. In one method the cover crop is disked lightly about three weeks before planting to kill the growth without incorporating it with the soil. Furrows are then opened with two 22-inch middlebuster shares (moldboards removed) preceded by coulters and followed by reversed disk hillers. This provides a deep clean furrow for planting corn. The area between the furrows is loosened with 26" sweeps preceded by coulters. The other mulching method (called the balk method below) is similar except that the disking operation is omitted. Where the winter cover crop growth was killed by disking about three weeks before planting, worm injury to the corn was eliminated while the worms caused considerable damage when the disking treatment was omitted.

"The influence of these cultural treatments on runoff and erosion from 3.1 inches of rainfall on July 19 and 20, 1945 is shown below in comparison with plowing and clean cultivation:

Tillage treatment	Winter cover crop preceding the corn	Runoff, per cent	Soil loss, pounds per acre
Mulch, balk method.....	Vetch and rye	4.7	106
Mulch, disk method.....	Vetch and rye	4.3	221
Clean cultivation, plowed.....	Vetch and rye	22.8	242
Clean cultivation, plowed.....	None	54.5	2,288

Methods and Dates of Planting Kudzu in Alabama - E. C. Richardson, Auburn, Alabama.-"In an attempt to learn if cheaper ways of setting kudzu could be used and to extend the planting season, kudzu crowns were planted in late November, January, and early March, using three different planting methods. The three methods of planting were the shallow furrow method, the deep furrow method, and the hole method. The shallow furrow method consisted of opening a furrow with a 6-inch turn plow, placing plants upright adjacent to the perpendicular side of the furrow and holding the plants in place with a small amount of soil pulled in by hand. The planting furrow was filled with soil by plowing a furrow and covering the plants slightly. Usually two or more furrows were made with the wing turned to the plants in the covering process.

"The deep furrow method differed from the shallow furrow method in that a list was formed over the plants by plowing both ways in the covering process. This covered the plants 3 to 4 inches deep which offered added protection to the crowns during winter months. The top of the list in the deep furrow method was drug off in March before growth started, to remove the excess soil. In the hole method, planting holes were opened with a mattock and the plants set entirely by hand. Plantings were made on three different dates, late November, January and March. Plantings by the shallow furrow method and hole method were made in Escambia, Butler, Lee, Chilton, Cullman, Randolph, and Limestone counties. Plantings by these methods were made on each of the three planting dates. Plantings by the deep furrow method was made in Escambia, Lee, Chilton, and Limestone counties. This method was used only in the November planting.

"Planting areas were selected in late summer of 1944. Preparation of soil consisted of breaking or the plowing of wide beds. In most cases, land preparation was fair to good. Commercial crowns were used for planting stock, all of which were small and weak. They were dug, and delivered to Auburn usually in three to five days after digging. Plants were loaded into a truck and carried to the different plant sites. Planting in most cases was completed within two weeks after plants were dug. Survival counts were made in June following the planting season. The average survival for all the plantings was approximately 60 per cent for all planting dates, although the percentage survival for the individual plantings varied considerably by location, date and method of planting, and soil types. Higher survivals were obtained on the sandy soils than on the clay soils. This was probably due to the absence of crusting in the sandy soils.

"In the November planting the percentage survival was 62, 57, and 55 for the deep furrow method, shallow furrow method and hole method, respectively. The higher survival of crowns planted by the deep furrow method probably was a result of protection from frost and winter injury. There was a gradual increase in percentage survival from north Alabama to south Alabama for the November planting. This trend was consistent for all plantings made in November, but was not consistent for the other planting dates. This is probably due to temperature relationships. Average survival percentages were as follows:

"Survival of kudzu crowns by method and date of planting
in North, Central, and South Alabama

Method and date of planting	Location in Alabama		
	Northern	Central	Southern
Planted November 1944			
Deep furrow.....	53.0	64.5	64.3
Shallow furrow.....	48.5	56.9	71.3
Hole method.....	42.0	58.7	60.7
Planted January 1945			
Shallow furrow.....	35.7	60.6	70.4
Hole method.....	60.0	54.3	72.4
Planted February 1945			
Shallow furrow.....	66.0	61.1	66.5
Hole method.....	71.7	54.7	56.6

Volunteer Winter Ground Cover Produces Best Fruit - J. C. Moore,
Auburn, Alabama.-"In comparison with clean cultivation five groundcover treatments were used to conserve the soil and at the same time try to answer the question, 'Is clean cultivation essential for fruit production?' The following table gives the 1945 yields of peaches and plums for each treatment. No cold injury reported for the first time since the orchard was planted. Average yields are low due to several replants not bearing.

"Yield of plums and peaches in 1945 by ground cover treatments

Treatment	Plums		Peaches	
	Trees	Per tree	Trees	Per tree
	<u>Number</u>	<u>Pounds</u>	<u>Number</u>	<u>Pounds</u>
Winter cover of crimson clover and Italian ryegrass - later changed to Bur clover and Rescue grass. Weeds mowed in summer after winter cover dies. Volunteer reseeding in fall.....	19	78	40	90
Lespedeza Sericea cut and let lie in place.....	7	78	16	88
Clean cultivation.....	13	54	27	90
Lespedeza Sericea cut and concentrated around tree for mulch.....	20	56	44	69
Lespedeza Juncea cut and let lie in place.....	7	96	15	50
Lespedeza Juncea cut and concentrated around tree as mulch.....	22	66	47	56

"Winter ground cover treatment is outstanding. The best grade of fruit was produced with this treatment. Lespedeza Sericea cut and let in place is better than mulching. Erosion is noticeable in clean cultivation plots. Bermuda grass is seriously damaging the stand of Lespedeza Juncea.

Major Brown Writes From India - Major R. E. Brown of the 16th Airborne Anti-Aircraft Bn., formerly in Soil Conservation Research at Blacksburg, Virginia writes of his experiences in South American, Africa, Burma and India. The following are a few extracts from his letter.-"Our first view of India was over the desert area, and we were told that the rainy season, which had just ended, was the heaviest in many years. There was an indication of fair vegetative cover; many thorn bushes of one species or another were everywhere. These thorn bushes are vividly remembered since we hired bicycles to ride around the Camp area. Everyday or so we had to have a tire fixed because of thorns. We then started tire inspection every morning, pulling out any thorns that had not reached their mark. This procedure helped a great deal.

"On the next trip, the most important thing we saw was the TAJ MAHAL. Just before landing we reached the tea plantation area of India and, from the air, it was a very interesting sight. The even patterns of the plantations appeared as orchards since they employ large trees, spaced uniformly throughout the plantation, for shading the tea bushes. Throughout this area there is some jungle growth and many rice paddies. The wild vegetation is very profuse the year around despite the fact that there is a rainy and dry season. My travels and observation have been in the dry seasons.

"Many people are led to believe that in Burma you will see only dense jungle and Teak-wood forest. I wish to disagree with this idea as Burma has many possibilities and much open land partially cultivated. There is much jungle and mountainous country, but there are also wide valleys. An ancient practice, still in use, that may have religious significance, is to clear and burn off the hill tops and cultivate the land. The tribes eventually abandon the area and clear another hilltop. The jungle has done a fair job of reclaiming these eroded areas, but erosion is taking its toll. If the practice of burning and moving on was for some reason accelerated, severe damage would be the result.

"It is most enjoyable to ride above this country and see the many possibilities for different types of agriculture. Burma, too, has the Monsoon and dry season, but there is some rain during the dry season. The valleys of Burma are large and flat with an occasional mountain or hill rising abruptly. The water ways, rivers and streams, are very extensive but, in the dry season, they are greatly reduced in size. However, there is a good flow even in the dry season. It can be assumed that there is a sufficient quantity of water for artificial irrigation. Many of these rivers are as clear as crystal, even when the river rises one to two feet. If I remember correctly, most of our rivers the size of these would be very muddy if the water level were to rise that much. This fact alone indicates very little erosion.

"The Poinsettias I found in this area were the most beautiful I ever hope to see. The individual plants had hundreds of well shaped petals which were a brilliant red, with a few mottled red and green petals. I particularly remember seeing them on Christmas Eve of last year. A person could have made a small fortune if he had all the flowers I saw for sale in one of our large cities.

"I saw many areas covered with common lespedeza throughout Burma. The species of grasses are numerous. Many of our poor land grasses are to be found. I found a plant quite similar to our Kudzu; it is a native species, I believe. The plant is not as healthy as ours but it does grow very rapidly. There has not been much, if any, control in the use of this plant. I did see one place where it had been planted, apparently, by US Troops on a bridge abutment. It was doing a very nice job of holding the soil.

"It is very satisfying to fly over the flat plains and imagine the possibilities for cattle raising and farming in general. Someday, someone will start this program on a large scale."

Nitrogen Deficiency Symptoms with Subsurface Tillage - John Lamb, Jr., Ithaca, New York.-"Soil moisture has been adequate and the corn has been making rapid growth. During the last two weeks the corn on plots with high rate fertilization has shown an average daily growth of nearly 3 inches per day. The corn on most all of the plots is showing streaked chlorosis, probably indicating a magnesium deficiency. Several of the subsurface plowed or disked plots with manure or normal rate fertilization show nitrogen deficiency symptoms not appearing on the turn-plowed plots."

Cover Crops in Corn.-"Considerable difference in ryegrass growth between farms in Ontario County is apparently correlated with fertilizer practices. The Ontario District, Coke-Oven Ammonia Research Bureau, the State Experiment Station, G. L. F. and the farmers with encouragement from SCS are studying time, rate and method of fertilizer application that will give the maximum growth of ryegrass. Using 10-10-10, increases in growth for 400 pounds have been observed. Not enough more growth for 800 pounds per acre would justify the added expense. Broadcasting the fertilizer after corn harvest was just as effective as at the last cultivation of corn when the ryegrass was sown."

"Without any fertilizer, specifically applied for its benefit, ryegrass appears starved in September-October, when it should be growing very rapidly. Field brome grass (1 trial) was almost a failure without fertilizer. Up to 800 pounds of 10-10-10 broadcast either at the last cultivation or after harvest gave definite response - in fact, so good that plowing was accomplished only by shifting to the next lower gear than for corn stubble alone. Of course, any growth at all helps to slow up erosion, but apparently fertilizer is necessary with the cover crop to really stop erosion in the cash crop section of Ontario County."

Lower Soil Loss From Green-Manured Potatoes - L. T. Kardos, Durham, New Hampshire.-"For the second consecutive month precipitation at Northwood Ridge was considerably above normal, with a total of 5.27 inches during June. The normal for this month at Durham is 3.45 inches. Runoff and soil loss occurred twice with the greatest soil loss occurring from the potato plots which have not been green manured with winter rye. The soil loss from the green manured plots was only approximately one-half that from the un-green manured plots which lost an average of 7,000 pounds of soil per acre during the heavy rain of 1.15 inches on June 26."

Growth of Corn Following Cover Crops - Earl B. Kinter, State College, Pennsylvania.-"Corn where vetch and tall oatgrass were plowed down averages about a foot taller than that on the check plots and where ryegrass was plowed under. The taller corn is also noticeably a darker green. As there was a considerable growth of each of the three cover crops prior to plowing, it is evident that more rapid decomposition of the succulent oatgrass and vetch as compared to the tougher ryegrass has accounted for the growth and color differences of the corn."

Cornstalk Compost and Beet Yields - Oren R. Neal, New Brunswick, New Jersey.-"Beets were harvested to compare the effects of corn stalk compost with commercial fertilizer, Yields from the three blocks are shown below:

Yield of beets with compost and fertilizer treatments,
Marlboro, New Jersey, 1945

Treatment	Application per acre	Weight of -	
		Beets	Tops
		<u>Pounds</u>	<u>Pounds</u>
None.....	--	12.1	8.3
Fertilizer, 5-10-10.....	1,000 pounds	31.8	16.3
Cornstalk compost.....	20 tons	27.1	17.2
Superphosphate.....	300 pounds		

Conservation Farming Increases Production - E. L. Sauer, Urbana, Illinois.-"Volume of business oftentimes can be increased without increasing the acreage in the farm. In the years 1935-1938 an Illinois farm of about 125 acres had approximately 30 per cent of the tillable land in hay and pasture, milked an average of 10 cows, had 60 to 70 per cent of the gross income from livestock and had a net income of about \$1,600 a year. A complete farm plan was developed, with particular emphasis on soil conservation and improvement and the efficient use of the increased acreage of improved legume hay and pasture by livestock. This farm now has 50 per cent of the tillable land in improved legume hay and pasture, is producing 50 per cent more pounds of grain on 25 per cent fewer acres, and average of 20 cows are being milked, 95 per cent of the income is from livestock, and net income, based on 1935-1938 farm prices, has increased by over 40 per cent."

Color and Growth of Corn Varies with Treatment - D. D. Smith, Columbia, Missouri.-"The growth of corn on the treated plots, with sweet clover under as green manure, is shoulder high and has a dark green color, in comparison to half the height and a light green color for the corn without soil treatments and legumes preceding. Corn following 1 or 2 years of meadow has a much superior growth and color than that following 4 years of meadow (no legumes the last year)."

Root Worm Damage to Corn - G. M. Browning, Ames, Iowa.-"An unusually large amount of damage from Northern Root Worm is evident in Western and South-western Iowa this year on fields which have been planted to corn for three or more years. During recent rains in which there was considerable wind at the Experimental Farm, third year corn following ten years of bluegrass or alfalfa was flat on the ground without a single stalk standing. In some cases the stalks were actually blown out of the ground because of the fact that they did not have a root system. An adjacent corn plot which is first year corn in the rotation corn, oats, clover was standing upright without a single stalk having been blown down."

"Generally damage on second year corn will not exceed more than 5 to 10 per cent, but this year on Experiment VI there was from 50 to 60 per cent of the stalks on the second year corn plots which are badly down and which have a very limited root system. Apparently moisture and temperature conditions during the last few years have been unusually favorable to the development of the root worm. Although there is evidence of both Northern and Southern Root Worms, Mr. Harold Gunderson of the Entomology Department advises that the principal damage is from the Northern Root Worm."

Better Land Use and Cropping Practices Increase Yield - H. O.

Anderson, LaCrosse, Wisconsin.-"Comparisons were made between groups of farms in Grant County with high and low land use capability ratings. A larger proportion of the cropland on farms in the high capability group was used for corn and small grain production than on farms with lower land use capabilities. The percentage of cropland in corn, even for the former group, was smaller than the average for the county.

"The percentage increase in corn acreage in the last three years was greater on the soil conserving farms than for Grant County as a whole. Even with this greater increase in corn acreage and decrease in hay during the war period, the six-year average percentage of corn was smaller on the soil conserving farms than average per farm in the county. In other words, the rotations on these farms were more soil conserving.

"In spite of the more soil-conserving and fertility-maintaining rotations on farms of lower land capability, yields of crops are substantially lower than on the high capability farms. The differences in yields are more likely due to differences in present depth of topsoil, which in turn is due to a large extent to differences in amount of soil erosion.

"Unusually favorable weather conditions and improved varieties of corn and grain were two of the most important factors in the yield increase in the county during the 6-year period. Soil conserving practices, including more desirable crop rotations, no doubt were major factors in the greater increase in yields on the soil conserving farms than for the county as a whole. Average yields for the 6-year period were 14 per cent higher on the high capability farms and 6 per cent higher on the low capability farms than the average for all Grant County farms.

"Use of cropland and crop yield per acre on farms of high and low land use capability as compared with Grant County average

	Soil conserving farms		12 non-soil-conserving farms	Grant County average
	High capability	Low capability		
	Per cent of cropland			
Use of cropland				
1939-44				
Corn.....	32	27	33	34
Small grain.....	29	27	31	28
Hay.....	39	46	36	38
1939-41				
Corn.....	29	25	29	31
Small grain.....	30	27	31	29
Hay.....	41	48	40	40
1942-44				
Corn.....	34	29	37	36
Small grain.....	29	27	31	28
Hay.....	37	44	32	36
	Per cent of 1939 Grant County average			
Crop yield per acre				
1939-40.....	129	119	132	116
1941-44.....	160	148	156	136
Increase during war period..	31	29	24	20

Nitrates and Microflora on Stubble-Mulched and Plowed Land - F. L. Duley, Lincoln, Nebraska.-"In our microbiology work nitrate determinations on the soil showed little difference between stubble mulch and plowed land at Lincoln, and the plants show no indication of nitrate deficiency. However, at the Hastings Project there was higher nitrate on the plowed land.

"Counts made on the number of fungi and bacteria on stubble-mulched and plowed land have so far not shown any great differences in the number of different microorganisms present. Laboratory tests show that the rate of decay as indicated by CO₂ evolution proceeds at much the same rate whether organic residue material is mixed with soil or left on the surface as a mulch. This result is probably being duplicated in the field fairly well this season, due to the large amount of damp, cool, cloudy weather."

Inoculation of Cowpeas in Pots - H. O. Hill, Temple, Texas. - "In general, inoculation of legumes growing on the Rendzina soils of Texas does not give greatly increased legume growth. Some response to inoculation has been obtained at this station, though in most cases little has been obtained. A greenhouse pot experiment with cowpeas was carried out in an attempt to obtain information relative to this important phase of legume growth. The treatments and results of this experiment are as follows:

"Dry matter produced in pots by cowpeas
(Average of 3 replicates)

Fertilizer treatment per acre	Inoculated		Not inoculated	
	Tops	Roots	Tops	Roots
		Grams per pot		
None.....	7.1	4.1	6.4	3.8
200 pounds superphosphate.....	13.3	6.6	8.8	5.4
400 pounds superphosphate.....	13.2	6.1	9.5	5.2
400 pounds superphosphate plus 200 pounds muriate of potash.....	12.4	6.2	8.3	4.4
800 pounds superphosphate.....	12.7	6.6	9.4	5.0

"It may be concluded that under greenhouse conditions:

1. Inoculation alone does not increase legume growth on these soils.
2. Phosphate fertilizer alone, without inoculation, increases legume growth approximately 30 per cent.
3. Phosphate fertilizer and inoculation together increases legume growth approximately 100 per cent.
4. The low rate of fertilizer application of 200 pounds per acre is as effective as the higher rates.
5. More information is needed on lower rates of phosphate application than 200 pounds per acre.

No Increase in Corn Yield from Side-Dressing with NaNO_3 .-"The relative values of commercial nitrogen and legume nitrogen for corn production in this area have not been determined. This problem will assume greater significance when synthetic nitrogenous fertilizers become available during the postwar period.

"An experiment to obtain information on this problem was conducted during the summer of 1945. This experiment was set up as a randomized block experiment with 3 replicates for each treatment. Different rates of NaNO_3 to give 0, 25, 50, and 75 pounds of nitrogen per acre were applied as side-dressing at the last cultivation of corn on May 25, 1945. The experiment was conducted on fertile Houston black clay soil, which was fallow in 1944. An open-pollinated corn (Nelson's yellow Dent) was grown. The results obtained are shown in the table below. These data were collected under greenhouse conditions and should not be interpreted as being directly applicable to field conditions.

"Stand count, ear count, and corn yield from nitrate fertilizer study

Fertilizer treatment	Stalk count	Ears harvested*	Corn yield, pounds	Corn yield, Bu./A**
No nitrogen.....	101	103	61.5	41.3
25 pounds N per acre...	107	102	61.8	41.5
50 pounds N per acre...	104	97	61.6	41.4
75 pounds N per acre...	96	93	57.8	38.9

*Ears which were poorly developed as a result of smut were not harvested
 **Average of 3 replications.

"Corn did not respond to a side dressing of nitrogen under the conditions of this experiment. The lack of response of corn to commercial fertilizer on blackland soil indicates that the soil fertility problem of the Blacklands may be tied up with organic matter relationship. Substantial increases in corn yields have been experienced when legumes were used as a source of nitrogen."

Contoured Cotton in Rotation Out-Yields Continuous Cotton - George W. Hood, Batesville, Arkansas.-"The cotton got off to a poor start but is now making a very rapid and satisfactory growth and the squares are appearing in numbers. The prospect at this time is for a good yield of cotton, where conservation practices, rotation and contouring have been used. Where continuous cotton is grown with the slope there is evidence it will be a complete failure. Five year average yields for continuous and rotation cotton are as follows:

"Yield of continuous cotton planted with the slope and contour
planted cotton in 3-year rotation with lespedeza,
1940-44 average, Batesville, Arkansas

Kind of soil	Continuous cotton, with the slope	Contoured cotton in 3-year rotation
	Pounds per acre	
Ozark soil.....	149	284
Baxter soil.....	412	499

Phosphate Increases Growth of Upland Pasture - J. B. Pope, Tyler, Texas.-"An application of 200 pounds of superphosphate per acre applied in November 1944 increased the clover and grass yields the following spring and summer. The greatest increase was on the spring growth of clovers. The percentage increases from clippings made in April and July were 48 and 27 per cent, respectively. The areas had good stands of spring clovers with Bermuda and Dallis as the base sod grasses."

Crop Yields in South Dakota - Edgar C. Joy, Brookings, South Dakota.-"South Dakota has an excellent small grain crop this year and contour farming, particularly in the western part of the State, is showing up good. Subsurface tillage is poor. Water spreading on grass land increased the growth a great deal. At Brookings, the corn on grass land plowed out last fall is better than on the corn-wheat check plots. Wheat appears to be just the reverse."

Contour Tillage Practices on Fallow Increase Wheat Yield - Alvin E. Lowe, Garden City, Kansas.-"The value of contour farming is clearly demonstrated in this year's data as well as the five-year averages for wheat yields by cultural treatments of fallow land. Forty-four-inch basin listing on the contour of fallow for wheat has a five-year average of 24.2 bushels of grain per acre, whereas, the same method up and down slope has an average of only 20.1 bushels. Ordinary listing on the contour is almost equal to basin listing, having an average of 23.7 bushels, but ordinary listing up and down the slope has an average of only 18.5 bushels which is 5.2 bushels below ordinary listing on the contour and 1.6 bushels below basin listing up and down the slope. The 30-inch basin tool when used on the contour also out-yielded the same tool used up and down the slope by 2.8 bushels for the five-year period.

"Basining on the contour gave no advantage over ordinary contour listing but when used up and down slope, it gave higher yields for the five-year average. The trashy fallow or subsurface tilled plots yielded better this year but not equal to the one-wayed plot.

"Grain yields of winter wheat produced by various cultural treatments of fallow, Garden City, Kansas

Cultural treatment	1945	1941-1945 average
	<u>Bushels per acre</u>	
44-inch basin list on contour.....	24.5	24.2
44-inch ordinary list on contour.....	24.6	23.7
44-inch basin list up and down slope.....	19.1	20.1
44-inch ordinary list up and down slope.....	16.6	18.5
30-inch basin on contour.....	32.2	23.8
30-inch basin up and down slope.....	25.8	21.0
One-way on contour.....	30.2	23.8
One-way, basined on contour.....	24.1	21.8
Good farm practice (basined on contour)....	25.0	22.3
Trashy fallow (straight) blade or sweeps....	28.9	18.4*

*Not comparable to other methods, as short fallow period first two years in getting method started."

Stubble Mulch Tillage for Wheat - C. W. Lauritzen, Logan, Utah.-"Rainfall for the month of July totaled 0.10 inch. Wheat was ripening at the end of the month. Stubble mulch tillage with sweeps proved ineffective in controlling the volunteer sweet clover and subsequent tillage with a Wheatland plow was necessary."

Low precipitation in West Texas - C. J. Whitfield, Amarillo, Texas. - "The month of July has continued dry with a total of 1.30 inches of precipitation. This amount was received in six storms ranging from .08 inch to .52 inch. Very little of this precipitation was effective to crop growth because of the small amount received at any one time and the rapid loss by evaporation. A total of 5.10 inches has been recorded since the first of January. This makes a deficiency of 4.89 inches for the first seven months of 1945, based on the 7-year average at the Experiment Station, and 7.13 inches compared with the 53-year average at the Amarillo Weather Bureau.

"Samples were taken to determine the depth of moisture penetration on all sorghum fields. There was from 24 to 36 inches of good moisture on all fields where sorghum followed wheat and the field kept clean of volunteer wheat and weeds. On the continuous sorghum plots and the fields left over the winter in volunteer wheat, there was about 20 inches of fair soil moisture. Most all of the subsoil moisture was stored during the summer and fall of 1944.

"As a result of very little effective rainfall during July, only a small percentage of wheat shattered in the field has sprouted. If such conditions continue for another thirty days, it will be difficult to properly prepare a seedbed and kill volunteer wheat on wheat land that is to be returned to wheat this fall. At the present time, there is very little or no available moisture in the soil of fields which produced a wheat crop this season. Considerable effective rainfall will be needed between now and seeding time to provide anything like favorable conditions for seeding. Land that was in sorghum last year and land which has been fallowed since wheat was harvested last year is moist, except for the surface four inches, to a depth of 24 to 26 inches. This moisture was stored from the late fall and early winter precipitation. Because of this stored moisture, it was necessary to till all fallow fields and fallow plots in the stubble-mulch series during July to kill weeds.

Controlling Hornflies with DDT. - "The DDT test for controlling hornflies on steers was completed August 1, 1945. The treated group made a total gain of 80 pounds per head for the 77-day period, May 16 to August 1, 1945, or a daily average gain of 1.04 pounds per head. This compares with 70 pounds per head, or 0.91 pound daily average gain on the untreated steers for the same period. Obtaining this increased gain of 10 pounds per head would probably be considered impractical from the standpoint of treating range cattle. Differences in gains are not significant enough to offset the cost of handling and treating cattle."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. A. Westby, North Appalachian Experimental Watershed, Coshocton, Ohio.-"The total rainfall for the month was 2.72 inches. The average rainfall for July is 4.19 inches. Each of the first seven months of 1945 has had more precipitation than the corresponding month of 1944. However, there have been no storms this summer with either large amounts of rain or high intensities.

"July 1945 soil moisture data available on corn mulch plots as compared with July 1944 data are as follows:

Percentage of Soil Moisture on Mulch Plots

Tillage	July 1944		July 1945		July 24, 1945
	Soil depth		Soil depth		Corn height
	0-7"	7-14"	0-7"	7-14"	(inches)
	Percent	Percent	Percent	Percent	Inches
Plowed	8.1	9.2	15.6	14.4	64.0
Disked	10.0	11.4	16.7	14.8	54.3

"The disked plots required considerable replanting and this accounts for the corn on these plots not being as tall as on the plowed plots.

"The small difference between the moisture content of the disked and plowed plots this year as compared with the difference between the same plots last year can probably be accounted for by the type of rainfall this year in that there has been little or no runoff from either plots, while last year the rainfall of high intensities produced considerable more loss of water on the plowed plots than on the disked plots."

Hydrologic Studies - I. W. Bauer, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"For the month of July precipitation at the meteorological station was 3.87 inches. This is .65 inch more than the 46-year mean and the most precipitation that has been recorded at the project in July.

"Harvesting of small grain was completed during the month. The wheat and the subtilled oats were combined. The other oats plots were cut with a binder and will be threshed next month. The 40-rod row samples of the wheat and oats showed a yield as follows:

Contoured			Straight Rows			Subtilled		
Plot :	Grain :	Straw :	Plot :	Grain :	Straw :	Plot :	Grain :	Straw :
	bu./acre	lbs./acre		bu./acre	lbs./acre		bu./acre	lbs/acre
WHEAT								
4H	14.0	1,560	8H ^{1/}	17.7	2,300	19H	16.0	1,970
12H	15.1	1,840	17H ^{1/}	8.2	1,150	24H	13.2	1,710
Ave.	14.6	1,700		13.0	1,725		14.6	1,840
OATS								
5H	30.3	2,040	3H	26.9	1,000	21H	25.4	1,260
13H	29.7	1,210	16H	27.8	1,540	22H	29.6	1,540
Ave.	30.0	1,625		27.4	1,270		27.5	1,400
						11H ^{2/}	23.0	960
						14H ^{2/}	23.9	1,170
						Ave.	23.4	1,065

1/ 17H had 60 percent hail damage in storm of May 26. Other plots had from 10 percent to 15 percent damage.

2/ 11H and 14H changed to sub tillage last spring.

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana. - "A rain of 2.23 inches on the Dairy farm on July 13-14, with a maximum 10-minute (approximate concentration time of watersheds) average intensity of 1.80 inches per hour, produced runoff from pasture and woodlot watersheds as follows:

Runoff from Pasture and Woodlot Watersheds
Purdue Expt. Sta. Dairy Farm, Lafayette, Indiana
July 13-14, 1945

(2.13" Total Rain, Max. 10 Min. Intensity of 1.80"/hr.)

Watershed:		Total Runoff		Peak rate of runoff
Number :	Treatment and Cover	Inches :	% Rainfall:	In. per hr.
31	Perm. pasture, bl. grass	0.4063	33.03	0.4440
32	Perm. pasture, bl. grass	0.0752	6.11	0.0749
33	Pastured woodlot	0.0777	6.31	0.0770
34	Protected woodlot	0.0069	0.56	0.0038

"Watersheds 32, 33 and 34 are respectively contiguous. Performance of the pastured woodlot and adjacent blue-grass pasture were similar, while the protected woodlot produced much smaller total runoff and a very low peak rate.

"The difference in performance of the two blue-grass pasture-watersheds, Nos. 31 and 32, is consistant with other data for these watersheds and is attributed largely to soil influences. No. 31 has been more recently cultivated and is more severely eroded. Earlier infiltration studies

have shown its surface soil to be much less pervious than that of No. 32. An important point of these data is their variability and the indication that relatively high water losses and runoff intensities may occur from pastures with impervious eroded soil, in spite of fairly good grass cover.

"Hay and wheat yields were determined for the experimental watersheds by sampling. The following tables show the comparison of yields for conservation and 'prevailing practice' treated^{1/}watersheds:

1945 Hay Yields, Experimental Watersheds
Purdue-Throckmorton Farm, Lafayette, Indiana

Watershed : Number	Practice	: Yields, lbs./acre
5	Prevailing	3343
8	Prevailing	3298
6	Conservation	5014
7	Conservation	5392

1945 Wheat Yields, Experimental Watersheds
Purdue-Throckmorton Farm, Lafayette, Indiana

Watershed : Number	Practice	: Yields, bu./acre
4	Prevailing	37
12	Prevailing	37
2	Conservation	46
11	Conservation	40
1	Mulched ^{2/}	42

^{1/} Corn, wheat, meadow rotation, 'square' tillage and seeding, common (light) fertilization of corn and wheat on 'prevailing' practice watersheds; same rotation, contour seeding, heavy fertilizer application and manure plowed under for corn, heavy fertilization and manure top dressing of wheat on conservation treated watersheds; in second rotation under differentiated treatment.

^{2/} Wheat followed corn grown under meadow residue mulch, corn residues removed, wheat top dressed with manure.

"Fields of wheat on plots which were prepared for corn in 1944 by disking, sub-tilling and plowing under of meadow after-math, showed no significant differences. The following are yields of oats after corn with various methods of seed-bed preparation for both the oats and corn showing highly significant advantage of plowing (average yield of three replicates):

<u>Treatment</u>	<u>Yield bu./acre</u>
Surf. residue, shallow till (sweeps)	44.3
Surf. residue, deep till (sweeps)	39.8
Residue mixed to 3", shallow till (sweeps & disc)	45.2
Residue mixed to 3", shallow till (disc only)	40.0
Plow, 7"	60.8

"Meadow-residue-mulched-corn-plots show outstanding differences in stand and development for various locations of residue and depths of tillage, indicating advantage for plowed plots. However, these differences continue to be much less apparent on highly fertilized plots than with lower fertilization, bearing out previous indications of important inter-action between tillage and fertilization practices requiring modified fertilization practices for successful mulch culture of corn."

Hydrologic Studies - R. G. White, East Lansing, Michigan.-

"During the second week of July, the Farm and Horse Department at Michigan State College harvested the alfalfa-brome crop on Watershed 'B' (cultivated) and that portion of the field lying west of the instrument-shelter house. No report has been received to date as to the yield of the hay crop. On July 31 and August 1, the Farm and Horse Department clipped Watershed 'A' (cultivated) and that portion of the field lying east of the instrument-shelter house, but did not utilize for hay this portion of the field. The entire field has been heavily pastured with sheep through the entire crop year, and as the east portion of the field was more heavily grazed, it was not considered suitable for hay.

"On July 16, members of the Michigan Association of Teachers of Vocational Agriculture visited the cultivated watersheds as a part of a tour arranged by the Soil Science Department of Michigan State College. A brief summary sheet was prepared setting forth runoff and erosion data for the project since its record was started early in 1941. These data are given on the next page.

Microbiological Studies - F. L. Duley, Lincoln, Nebraska.-

"Nitrate determinations on the soil showed little difference between stubble mulch and plowed land at Lincoln; and the plants show no indication of nitrate deficiency. However, at the Hastings Project there was higher nitrate on the plowed land."

"Counts made on the number of fungi and bacteria on stubble mulched and plowed land have so far not shown any great differences in the number of different microorganisms present. Laboratory tests show that the rate of decay as indicated by CO₂ evolution proceeds at much the same rate whether organic residue material is mixed with soil or left on the surface as a mulch. This result is probably being duplicated in the field fairly well this season, due to the large amount of damp, cool, cloudy weather."

WATERSHED RUNOFF AND EROSION DATA

Year	Crop	Cultivated Watersheds				Wooded Watersheds			
		Precip.	Percent Runoff	Soil Loss T/acre	Precip.	Percent Runoff	Soil Loss T/acre	Precip.	Percent Runoff
		"A"	"B"	"A"	"B"	"A"	"B"	"A"	"B"
1941 ¹	Corn	25.6	8.0	8.4	9.9	11.4	24.6	1.5	0
1942	Oats	34.0	18.0	22.7	1.1	1.0	37.1	2.1	0
1943	Alfalfa-Brome	33.1	5.1	6.4	0	0	35.0	5.0	0
1944	Alfalfa-Brome	22.8	16.4	16.8	0	0	25.6	2.3	0
1945 ²	Alfalfa-Brome	19.0	5.5	5.5	0	0	18.6	0.4	0

Normal Precipitation - 30.52 inches, 40 year average, U. S. Weather Bureau, East Lansing, Michigan
 Stand at Wooded Watershed - Oak-Hickory type, well stocked
 1/ 1941 Data for April 1 to December 31, inclusive.
 2/ 1945 Data for January 1 to June 30, inclusive.

WATERSHED CHARACTERISTICS

Watershed	Area, acres	Average slope, %	Soil types	Max. length, ft.	Max. width, ft.
"A"	1.98	6.0	Metea & Hillsdale Loam	420	295
"B"	1.35	6.5	Metea & Hillsdale Loam	390	190
Wooded	1.65	6.1	Metea & Hillsdale Loam	340	280

Runoff Studies - H. K. Rouse, Colorado Springs, Colorado.-

"Precipitation during July averaged 6.29 inches, approximately 3 times the 7-year mean for this project. Measurable precipitation was recorded on 18 days. The United States Weather Bureau cooperative observer at Colorado Springs reports the July rainfall as the second heaviest in 67 years of record. The heavy precipitation is continuing into August. As this report is being written, rain has fallen on 11 of 13 days with a total precipitation averaging 4.01 inches for the several watersheds. This 11-day total is approximately double the 7-year August mean.

"The character of the precipitation has been highly variable with some 1-inch rains having very moderate intensities while others have had the characteristic high rates. The distribution of precipitation has been spotty and the normal trend of an increase in amounts at the stations with higher elevations has been reversed.

"At 4 of the 6 rainfall measuring stations new records for the 8-year period of observation were made on July 10, both for total amounts of rain in one storm and for intensities for periods of from 30 minutes to 2 hours. The maximum rainfall recorded was at station R-4 on watershed W-III (Blaney) where 2.64 inches of rain fell in 3 hours, 28 minutes. This rain was very intense with 2 inches of precipitation occurring in 49 minutes. Maximum amounts of precipitation for several time intervals were: 5 minutes, 0.31 inches; 10 minutes, 0.50 inches; 15 minutes, 0.71 inches; 30 minutes, 1.20 inches; 1 hour, 2.17 inches; 2 hours, 2.39 inches. These heavy rains have produced considerable runoff. The number of runoff periods for the various watersheds are: W-I, 7; W-II, 7; W-III, 6; W-IV, 6.

"New records for peak rates of runoff were made on Watershed W-II (Lebsch) (sandy loam-native pasture cover) of 0.86 inches per hour which compares with 0.30 inch per hour for the next highest record and on Watershed W-III (Blaney) (clay loam, native pasture cover) of 1.32 inches per hour which compares with 1.06 inches per hour for the next highest record. The proportion of the precipitation appearing as runoff was 18 percent on Watershed W-II and 24 percent on Watershed W-III.

"Runoff on Watershed W-I (Fulses) (sandy clay loam-cultivated) was heavy but had been exceeded on several previous occasions. Runoff during the storm of July 10 caused noticeable erosion but did not silt up the pondage area to any great extent. Smaller, though intense, storms occurred on July 21 and 23 following the drilling of oat strips on July 20 and 21 and removed appreciable quantities of soil. This resulted in important siltation of the pondage area to elevations at the stilling well higher than the weir notch, and necessitated a new topographic survey and pondage correction table.

"Numerous reports of extremely heavy precipitation in the area along the Front Range of the Rocky Mountains have been received. Mr. Rouse investigated one such report and found it substantially as reported. This storm occurred during the evening of July 31 in the vicinity of the Eleven Mile Canyon Reservoir of the Denver water supply system. It was recorded on one of the recording gages of the Weather Bureau's hydrologic net work which is attended by an employee of the Denver Board of Water Commissioners. A total of 6.28 inches of rain fell from 5:12 p.m. to 1:00 a.m. Maximum amounts of precipitation recorded for various time intervals were: 15 minutes, 1.31 inches; 30 minutes, 2.60 inches; 1 hour, 3.75 inches; 2 hours, 5.30 inches; 4 hours, 5.65 inches; 6 hours, 6.15 inches.

"Another similar storm was reported in the vicinity of Goodpasture, Pueblo County, Colorado on August 5. No recording gage is located in that vicinity, but on investigation by Operations engineers indicates 6 inches of precipitation in 2 hours. Slope-area measurements on a conservative basis indicate runoff of 2,450 c.f.s. from a 770-acre watershed of mixed cultivated and pasture land."

Hydraulic Studies - D. D. Smith, McCredie, Missouri.-"Calculation of retardance values for the bluegrass channels tested last November have been completed. Of the 3 cross sections tested the V-shaped channel with 6 on 1 side slopes had the lowest average velocities of flow for all flows above 10 c.f.s. This channel also had developed a more dense stand of bluegrass than the other two.

"Mr. Zingg completed a paper entitled 'Flood Control Aspects of Farm Ponds', which, after review, will be submitted for publication approval. It is a summary of the pond evaluation study carried out as a part of the cooperative investigations of the Meramec Basin under the work leadership of H. L. Cook of the War Food Administration. Preliminary cost estimates of the small reservoir system for the Meramec Basin were completed in cooperation with the State Department of Resources and Development. The paper entitled, 'Design of Retarding Ponds' is being reworked for subsequent publication."

Hydraulic Studies - C. W. Lauritzen, Logan, Utah.-"Attention was given to improving the photoelectric device for recording the silt content of the eroding stream and some modification of flumes. Two manuscripts which have been in progress for some time were submitted to the Director of the Experiment Station for review and criticism, one consisting of a report on laboratory studies conducted under the direction of Dr. Willard Gardner and the other of field studies by Dr. O. W. Israelsen."

Hydraulic Studies - A. W. Marsh, Corvallis, Oregon.-"Two irrigations were applied to the plots during July. To the irrigator, the difference in behavior between plots having mechanical water distribution between individual furrows and those controlled merely by shovel was very noticeable. The flow in the furrows was more uniform at the lower end of the plots having mechanical control and there was a much stronger tendency for all furrows to keep running. In the plots without control, the water ran too strongly in some furrows, carrying appreciable quantities of silt, while others failed to become wet at the lower end. Frequently on these plots furrows that had been running dried back because of change in the adjustment at the upper end due to erosion or silting. Observation of other farms in the vicinity and even other portions of the Experiment Station shows that most irrigators either have erratic flow in their furrows with some that dry back and others that flow too strongly, or they apply such a head that there is no change of any dry-back and there is excessive flow in all furrows. This means that a much smaller area can be "set" with a given flow in the head ditch. Silt accumulations at the lower end of such fields are mute evidence of another important result of this practice."

Hydraulic Studies - Stephen J. Mech, Prosser, Washington.-"A total of 50-plot-irrigations were made on the potatoe and alfalfa plots. One thousand six hundred soil samples furnished data on the soil-moisture conditions before and after each irrigation and also tended to emphasize the need for quicker and less laborious methods for measuring soil moisture.

"A similar number of runoff samples furnished additional information on the character of erosion or soil movement in the furrows during the course of an irrigation. These offer further evidence that erosion along the furrow is a dynamic characteristic which reaches a peak a few minutes after runoff begins and then gradually recedes until after 3-6 hours the runoff water is practically clear. (This clearing-up takes place faster on the heavier flows.) This proves that at least on Sagemoor soil, erosion is independent of the length of irrigation."

Hydraulic Studies - Vito A. Vanoni, California Institute of Technology, Pasadena, California.-"Report TR-65-CF-R-1 entitled 'Hydraulic Model Tests of Lake Coffee Mill Spillway' was completed and copies were forwarded to the Fort Worth offices. The model of Lower Caney Lake Spillway was constructed and preparations made to install it in the model basin. This structure was tested in 1943. Since that time it was found that the discharge flow used in the design is too small and it is now necessary to retest it for the higher discharge. Mr. S. R. Sapirie, Senior Engineer, Fort Worth, visited the Laboratory to inspect the model testing work."

Sedimentation Studies - Carl B. Brown, Washington, D. C. -

"In the investigation of sedimentation rates in the Central Valley area of California, reconnaissance surveys of 8 reservoirs were completed. All of the surveys indicated predominantly low rates of sediment production, ranging from approximately 50 to 300 tons per square miles per year. The low rates are attributed to the fact that very little cultivated land exists in any of the watersheds and the grass or forest cover is in generally good condition. A preliminary examination of various watersheds was made with personnel of the Conservation Survey Division and a program of watershed surveys was planned."

Sediment Studies - Vito A. Vanoni, Cooperative Laboratory,

California Institute of Technology, Pasadena, California. - "On July 17 and 19 the project was visited by Mr. Carl M. Forsberg, District Engineer, San Jose, California, to discuss sedimentation problems in the Pacheco Creek in San Benito County, California. The problem here is to confine the stream in order to prevent it from flooding farms in the valley. The grade of the stream flattens appreciably at the problem area, causing deposition in the channel and overbank flooding. After an analysis of the problem, it appeared possible to widen the channel at the point where deposition occurred, sufficiently to store the deposit from a major storm. This material could then be removed after the storm, making room for additional material brought down by subsequent floods. Based on sediment samples taken by Mr. Forsberg and surveys made under his direction, an estimate was made of the sand carried by the stream as a function of stage. These results can be used to estimate the amount of material brought in by a storm."

Drainage Studies - R. E. Morris, North Liberty, Indiana. -

"The meadow peppermint section of the drainage plots was distilled on July 23. The results are tabulated below:

Plot Number	Depth of Water Table Inches	Yield Lbs. of oil per acre
1	45	47.1
8	45	48.0
2	24*	43.3
7	24*	42.3
3	30	46.2
6	30	42.9
4	15	30.5
5	15	22.5

* Water table held at 40 inches until June 1 at which time it was raised to 24 inches."

IRRIGATION DIVISION

Evapo-Transpiration Losses Affecting Irrigation Practices - Santa Ana River Canyon Water Supply Study.-Dean C. Muckel reports that use of water by native vegetation for the 12-month period ending April 1, 1945 was 57 inches with a water table averaging 4 feet below the ground surface. It was decided that Mr. Muckel would contact the U. S. Engineer Office in Los Angeles regarding cross sections it has taken periodically in connection with degradation study of the river channel below Prado Dam. He was subsequently given a complete set of prints showing cross sections taken in 1938, 1941, and 1944 at 16 different locations. This work has been concentrated in the channel section extending from the Dam downstream to the Anaheim Union Water Co. canal intake. Mr. Bailey, Consulting Engineer for the Orange County Water District, has been anxious to have us include such a study in our report. The water level in all wells is dropping about 0.10 foot per week, which corresponds to the drop in water level of the flowing stream. Mr. Scott of the Geological Survey, and Mr. Muckel made a tour of the drainage area of Gypsum and Clay Mine Creeks. The watershed was very dry; even the low points of the canyon showed little evidence of any water. Observation wells at the mouths of these two creeks indicated that the ground-water level was about 7 feet lower than at the same time last year and that there was very little recovery during the winter season. Using data obtained by the U. S. Engineer Office, profiles were drawn showing the position of the low point of the river channel from Prado Dam down to the Anaheim Union Water Company canal intake, for the years 1938, 1941, and 1944. The dam was constructed in 1940 and since then the channel has lowered approximately 5 feet. There was undoubtedly a corresponding lowering of the ground-water level adjacent to the channel which would reduce the amount of water used by riparian vegetation.

Irrigation Requirements - California.-Arthur A. Young reports that the report on Irrigation Requirements of California Crops was assembled and mailed to the Berkeley and Los Angeles offices. It is a large report because in California, water is scarce and both State and Government agencies have for many years been studying quantities of water required by crops. Without such records it would be impossible to prepare a report on this subject that would be of assistance to technicians of the Soil Conservation Service or farmers in general who would like to know approximately what amounts of water are necessary for the production of average crops on different soils and in different parts of the State. All known authorities on irrigation requirements of various crops within the State have been reviewed. The data compiled include the results of soil moisture studies from which it is possible to estimate the irrigation requirements with a reasonable degree of accuracy; the irrigation of crops with the purpose of determining plant response rather than irrigation requirements; and a considerable number of records of irrigation water applied to different crops with no special purpose except to produce a profitable crop. The latter are of little value except for the purpose of showing a trend in the usual irrigation practice.

Seepage Losses Affecting Irrigation Practices - Seepage from pools.-Carl Rohwer reports completion of the text for report on seepage from pools, checking of water-surface and wetted-perimeter data for pool experiments on seepage, and assembled information on cost of concrete linings. After checking tables showing seepage losses from pools and revising table of costs of concrete linings, additional information was received from the Bureau of Reclamation which made it necessary to change the table of costs of concrete linings. A new table was prepared, containing current information on the methods of lining and the cost.

Snow Surveys and Irrigation Water-Supply Forecasts.-

R. A. Work reports that, accompanying Clyde Houston, several snow courses in the Nevada field were marked by means of steel pipe markers set in concrete. Several such course sketches were redrawn and particular attention was given to the more exact determination of snow-course elevations, also to exactly locating the courses on a reference map being prepared by Mr. Houston, which will show the location of all Nevada courses. Matters concerning future conduct of the snow-survey work were discussed in Boise with Messrs. Marr and Criddle. Particular attention was given to developing the form and scope of the west-wide snow-survey summary planned for initial issuance in April, 1946. A short conference was held in Boise with Wm. Tuller, Chief of Operations, Bureau of Reclamation, Region 1, relative to future cooperation by the Bureau in snow surveys in Nevada on Owyhee watershed. Understanding was reached as to the extent of the Bureau's future cooperation. In Portland, Oregon, a brief conference with G. H. Canfield, District Engineer, United States Geological Survey, revealed the fact that Mr. Marr's 1945 forecast of volume flow for the Columbia River at The Dalles, Oregon (lowest gaging station on the stream) was far more accurate than a similar forecast by another Government agency using a procedure differing from our snow-survey method.

W. T. Frost reports that the Army Engineers employed a field crew last winter which made bi-weekly snow surveys at a series of stations in the Willamette watershed. Examination of two series of such stations revealed that all stations found consisted of red flag markers along a road that was rapidly gaining elevation in each drainage. In conversation with local people it was found that the Army personnel were making use of a 3 or 4-inch sampling tube and were having great difficulty in removing complete cores.

Storage of Water Underground for Irrigation - San Joaquin Valley, California Cooperative Investigation.-Dean C. Muckel reports that notes and percolation data were received from Mr. Stockbridge for test ponds and large-area spreading in San Joaquin Valley, as conducted by the Kern County Land Company. Mr. Stockbridge reports complete failure of the "gopher-hole" plot. The plot took practically no water and a test showed that all of the holes had become plugged. Conferences were held with the Chief Engineer of Kern County Land Company, and

various officials of the Bureau of Reclamation. It has been proposed by the Bureau that it discontinue most of its field test ponds. The Land Company feels that it would then be carrying more than its share of the investigational work, and has requested a committee meeting to be called to consider a revision of the cooperative agreement. Daily percolation rates for the ponds of the Minter Field and Wasco groups were obtained from the Land Company and rates for the ponds in Tulare County were obtained from the Visalia office of the Bureau of Reclamation. Field observation sheets for the ponds in Kern County as operated by the Bureau of Reclamation were obtained and brought to Pomona for computation of the rates. Records are now available for the test pond in Tulare County which was equipped with a buffer pond. The inner pond, which is identical with all other ponds throughout the valley, has a rate of about 25 percent of the buffer pond. This buffer pond consists of a water area about 3 feet wide entirely surrounding the inside pond. It was suggested that the buffer pond now be turned off to determine whether a change in rate takes place on the inner pond. Several test ponds were visited, including the large spreading areas operated by the Kern County Land Company for a few weeks this summer. No water is now available for the large ponds.

Fred C. Scobey reports that all field data were kept up to date by plotting progress graphs and tabulating results for the many agencies involved. General deductions to be applied to large pools in the future, are not as favorable as could be wished. These are as follows:

1. Many of our deductions depend on the length of time water is to be available in our future spreading pools. (a) For periods of one or two months, most of our ponds show rates of 2 to 10 feet per day; highly satisfactory. (b) If we are to have water from two to four months each year, we still have the excellent rates of the first couple of months with much lesser amounts following. (c) For periods beyond 4 months, on many ponds the rate of evaporation might exceed the percolation. As a general thing the cost of operation would hardly be warranted.
2. Soils must rate as "sandy" in order to take water faster than 1 foot per day, for extended periods of time.
3. Rest or drying-out periods generally result in an improvement in rate of percolation. Sometimes there is a decline after the rest. Apparently a rest of a week or two is quite effective. Soil treatments did not lead to definite conclusions.
4. So far, it does not appear that great returns can be expected by planting rice in the ponds. While some increases appear to result from rice development, similar increases occur in ponds without rice or for any other visible reason.
5. The introduction of Santophen-20, in 1 pound doses every 10 days or so, either causes or is coincident with slight increases on Wasco Pond No. 18 and a marked increase on Wasco No. 19. Continued trial of Santophen under different conditions is recommended. Although the cost of most chemicals would be prohibitive on large pools, their use in research may lead to discovery of basic reasons for decline that have so far eluded us.
6. For soils other than those definitely open in texture, it appears that the performance of a large pool in actual operations cannot be

anticipated in close degree. The best results on any large pool will probably be developed by trial over a period of time. Consequently, it is not believed feasible to set up definite figures for pools of definite area in definite locations. Any preliminary estimates must probably be considered as just that - estimates only, with the possibility that actual performance is much more or much less than as estimated.

Imperial Valley Drainage Investigation, California -

William W. Donnan reports - Model sump studies.-Additional trials of the pit run sands from Mt. Signal indicate that we have found a very successful filter material. About 20 trial runs over a period of 60 days at heads ranging from 3 feet to above 12 feet have produced high flows through the filter. As a final test the mechanical vacuum pump was applied at full vacuum (head unknown) with no apparent leakage of bedding sands through the filter material. Trials with this sand were terminated on July 20, and the model sump apparatus was dismantled and cleaned preparatory to moving to the new location for the laboratory.

Meloland sump.-After seven 15-day cycles of on-and-off pumping, the meloland sump pump has been shut down due to mechanical difficulties. However, enough on-and-off cycles have been secured to indicate what effect pumping has on the water table. The periods when the pump was on had quite marked effect out for a radius of 150 feet. At 300 feet the effect was clearly evident although the cyclic drop was only about 0.20 foot on the average. At a radius of 600 feet the effect of pumping was very minor and for practical purposes was of no consequence. Pumping rate during these trials averaged about 5-1/2 gallons per minute. Canal seepage.-In an attempt to stop canal-bank seepage, the Imperial Irrigation District trenches and back-fills the bank to a depth of 6 to 8 feet below water line, the width of a drag-line bucket. This mulch is then impregnated with oil under jet pressure and the operation is designed to: (1) Destroy plant and tree roots; (2) destroy gopher holes; and (3) impregnate voids in the soil with oil. The operation is carried out with the canal in full operation.

Drainage and Irrigation Investigations, California, Arizona

and Texas - Pictorial reports.-Dean W. Bloodgood completed about 20 pictorial reports containing photographs he had taken, with a description of each and other information, of dams in southern California and Arizona; flood damage, water-spreading and ground-water investigations in southern California, and silt stations in Texas. It was planned to prepare several more of these reports and after they had been completed, to forward most of the original negatives to the Berkeley office for filing.

Studies of Irrigation Enterprise Organization.-

Wells A. Hutchins reports that steps have been taken to formalize a proposed project entitled "Adaptability of Irrigation Enterprise organization to Future Development." This is to be undertaken under a cooperative agreement between the Division of Irrigation, Soil Conservation Service, and the Division of Land Economics, Bureau of Agricultural

Economics. The project is set up with Mr. Hutchins as leader, and with two assistants from the Division of Land Economics. Field work is to be undertaken in various Western States.

Preliminary conferences in Berkeley and Washington were followed by conferences in Washington in July with representatives of the Bureau of Agricultural Economics. A cooperative agreement was drawn up, informally approved by the heads of the Divisions concerned, and sent to the Solicitor of the Department for approval as to form. A joint working plan was prepared for submission to the interested agencies, and a preliminary outline of data to be obtained is being considered by them. Conferences were held in Lincoln, Nebraska, July 20-21 on the details of the proposed work.

Water-Supply, Storage and Conveyance Facilities of Utah Irrigation Companies.-J. H. Maughan reports that work was continued on the manuscript of the bulletin reporting the study of irrigation companies in Utah. A trip was made into Cache and Box Elder Counties to interview irrigation officials regarding the functioning of certain irrigation companies in these areas, especially the Utah-Idaho Sugar Company, which is the largest irrigation enterprise in Utah. Interviews were held with a number of leaders interested in drainage in Utah, in connection with the proposed study of Utah drainage districts. A conference was held with leaders of the Extension Service to consider draft of sections pertaining to company irrigation systems. Check of information compiled from irrigation companies and other sources, on irrigation reservoirs in Utah, was made with State Engineer's records. Helpful suggestions were received from these agencies on data to be included in the report.

Plan of development of Central Valley, California.-

Paul A. Ewing reports a review with Eugene Carpenter of the Operations Division, of the report of the Comprehensive Plan of Development of Central Valley, California, recently completed by the Corps of Engineers, U. S. Army. Under the law authorizing the Army survey, the Department of Agriculture is obligated to pass on agricultural phases of this plan. The importance of these phases is indicated by the fact that in excess of 1,000,000 acres of presently dry land is involved in the plan, which proposes to bring that acreage under irrigation besides providing flood protection and developing hydroelectric power. The review by Messrs. Carpenter and Ewing discussed the probable economic effects of developing this land, and pointed out various precautions which should be taken, such as provision of erosion controls and drainage facilities, and carrying on of experimental demonstrations of recharge possibilities, before large-scale irrigation reclamation is attempted. The comprehensive plan does not include the Central Valley Project and other plans of the Bureau of Reclamation, which involve large additional acreages in the area covered by the report. The review of the plan has been sent to the Forest Service for concurrence and extension.

